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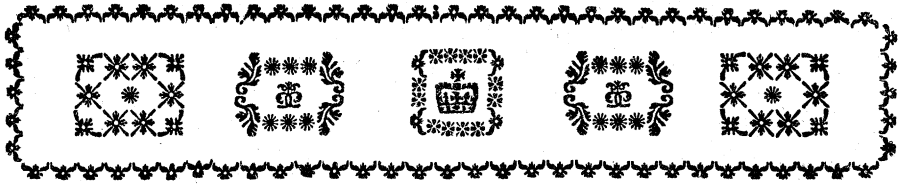
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PHILOSOPHICAL  
TRANSACTIONS.

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XIV. *Observations on the Natural History of the Cuckoo.* By  
Mr. Edward Jenner. *In a Letter to John Hunter, Esq.*  
F. R. S.

Read March 13, 1788.

TO JOHN HUNTER, ESQ.

DEAR SIR,

HAVING, at your request, employed some of my leisure  
hours in attending to the natural history of the Cuckoo,  
I beg leave to lay before you the result of my observations,  
VOL. LXXVIII. H h with

with a hope that they may tend to illustrate a subject hitherto not sufficiently investigated; and should what is here offered prove, in your opinion, deserving the attention of the Royal Society, you will do me the honour of presenting it to that learned Body.

The first appearance of Cuckoos in Gloucestershire (the part of England where these observations were made) is about the 17th of April. The song of the male, which is well known, soon proclaims its arrival. The song of the female (if the peculiar notes of which it is composed may be so called) is widely different, and has been so little attended to, that I believe few are acquainted with it. I know not how to convey to you a proper idea of it by a comparison with the notes of any other bird; but the cry of the Dab-chick bears the nearest resemblance to it.

Unlike the generality of birds, Cuckoos do not pair. When a female appears on the wing, she is often attended by two or three males, who seem to be earnestly contending for her favours. From the time of her appearance, till after the middle of summer, the nests of the birds selected to receive her egg are to be found in great abundance; but, like the other migrating birds, she does not begin to lay till some weeks after her arrival. I never could procure an egg till after the middle of May, though probably an early-coming Cuckoo may produce one sooner\*.

\* What is meant by an *early-coming* Cuckoo, I shall more fully explain in a Paper I intend to lay before you on the Migration of Birds; but it may be necessary to mention here, that migrating birds of the same species arrive and depart in succession. Cuckoos, for example, appear in greater numbers on the second than on the week of their arrival, and they disappear in the same gradual manner.

The Cuckoo makes choice of the nests of a great variety of small birds. I have known its egg intrusted to the care of the Hedge-sparrow, the Water-wagtail, the Titlark, the Yellow-hammer, the green Linnet, and the Whinchat. Among these it generally selects the three former; but shews a much greater partiality to the Hedge-sparrow than to any of the rest: therefore, for the purpose of avoiding confusion, this bird only, in the following account, will be considered as the foster-parent of the Cuckoo, except in instances which are particularly specified.

The Hedge-sparrow commonly takes up four or five days in laying her eggs. During this time (generally after she has laid one or two) the Cuckoo contrives to deposit her egg among the rest, leaving the future care of it entirely to the Hedge-sparrow. This intrusion often occasions some discomposure; for the old Hedge-sparrow at intervals, whilst she is sitting, not unfrequently throws out some of her own eggs, and sometimes injures them in such a way that they become addle; so that it more frequently happens, that only two or three Hedge-sparrow's eggs are hatched with the Cuckoo's than otherwise: but whether this be the case or not, she sits the same length of time as if no foreign egg had been introduced, the Cuckoo's egg requiring no longer incubation than her own. However, I have never seen an instance where the Hedge-sparrow has either thrown out or injured the egg of the Cuckoo.

When the Hedge-sparrow has sat her usual time, and disengaged the young Cuckoo and some of her own offspring from the shell\*, her own young ones, and any of her eggs that remain unhatched, are soon turned out, the young Cuckoo remaining possessor of the nest, and sole object of her future

\* The young Cuckoo is commonly hatched first.

care. The young birds are not previously killed, nor are the eggs demolished; but all are left to perish together, either entangled about the bush which contains the nest, or lying on the ground under it.

The early fate of the young Hedge-sparrows is a circumstance that has been noticed by others, but attributed to wrong causes. A variety of conjectures have been formed upon it. Some have supposed the parent Cuckoo the author of their destruction; while others, as erroneously, have pronounced them smothered by the disproportionate size of their fellow-nestling. Now the Cuckoo's egg being not much larger than the Hedge-sparrow's (as I shall more fully point out hereafter) it necessarily follows, that at first there can be no great difference in the size of the birds just burst from the shell. Of the fallacy of the former assertion also I was some years ago convinced, by having found that many Cuckoo's eggs were hatched in the nests of other birds after the old Cuckoo had disappeared; and by seeing the same fate then attend the nestling sparrows as during the appearance of old Cuckoos in this country. But, before I proceed to the facts relating to the death of the young Sparrows, it will be proper to lay before you some examples of the incubation of the egg, and the rearing of the young Cuckoo; since even the well known fact, that this business is intrusted to the care of other birds, has been controverted by an Author who has lately written on this subject\*; and since, as it is a fact so much out of the ordinary course of nature, it may still probably be disbelieved by others.

\* The Hon. DAINES BARRINGTON.

## EXAMPLE I.

The Titlark is frequently selected by the Cuckoo to take charge of its young one; but as it is a bird less familiar than many that I have mentioned, its nest is not so often discovered. I have, nevertheless, had several Cuckoo's eggs brought to me that were found in Titlark's nests; and had one opportunity of seeing the young Cuckoo in the nest of this bird: I saw the old birds feed it repeatedly, and, to satisfy myself that they were really Titlarks, shot them both, and found them to be so.

## EXAMPLE II.

A Cuckoo laid her egg in a Water-wagtail's nest in the thatch of an old cottage. The Wagtail sat her usual time, and then hatched all the eggs but one; which, with all the young ones, except the Cuckoo, was turned out of the nest. The young birds, consisting of five, were found upon a rafter that projected from under the thatch, and with them was the egg, not in the least injured. On examining the egg, I found the young Wagtail it contained quite perfect, and just in such a state as birds are when ready to be disengaged from the shell. The Cuckoo was reared by the Wagtails till it was nearly capable of flying, when it was killed by an accident.

## EXAMPLE III.

A Hedge-sparrow built her nest in a hawthorn bush in a timber-yard: after she had laid two eggs, a Cuckoo dropped in a third.

a third. The Sparrow continued laying, as if nothing had happened, till she had laid five, her usual number, and then sat.

June 20, 1786. On inspecting the nest I found, that the bird had hatched this morning, and that every thing but the young Cuckoo was thrown out. Under the nest I found one of the young Hedge-sparrows dead, and one egg by the side of the nest entangled with the coarse woody materials that formed its outside covering. On examining the egg, I found one end of the shell a little cracked, and could see that the Sparrow it contained was yet alive. It was then restored to the nest, but in a few minutes was thrown out. The egg being again suspended by the outside of the nest, was saved a second time from breaking. To see what would happen if the Cuckoo was removed, I took out the Cuckoo, and placed the egg containing the Hedge-sparrow in the nest in its stead. The old birds, during this time, flew about the spot, shewing signs of great anxiety; but when I withdrew, they quickly came to the nest again. On looking into it in a quarter of an hour afterwards, I found the young one completely hatched, warm and lively. The Hedge-sparrows were suffered to remain undisturbed with their new charge for three hours (during which time they paid every attention to it) when the Cuckoo was again put into the nest. The old Sparrows had been so much disturbed by these intrusions, that for some time they shewed an unwillingness to come to it: however, at length they came, and on examining the nest again in a few minutes, I found the young Sparrow was tumbled out. It was a second time restored, but again experienced the same fate.

From these experiments, and supposing, from the feeble appearance of the young Cuckoo just disengaged from the shell,

that it was utterly incapable of displacing either the egg or the young Sparrows, I was induced to believe, that the old Sparrows were the only agents in this seeming unnatural business; but I afterwards clearly perceived the cause of this strange phenomenon, by discovering the young Cuckoo in the act of displacing its fellow-nestlings, as the following relation will fully evince.

June 18, 1787, I examined the nest of a Hedge-sparrow, which then contained a Cuckoo's and three Hedge-sparrow's eggs. On inspecting it the day following, I found the bird had hatched, but that the nest now contained only a young Cuckoo and one young Hedge-sparrow. The nest was placed so near the extremity of a hedge, that I could distinctly see what was going forward in it; and, to my astonishment, saw the young Cuckoo, though so newly hatched, in the act of turning out the young Hedge-sparrow.

The mode of accomplishing this was very curious. The little animal, with the assistance of its rump and wings, contrived to get the bird upon its back, and making a lodgement for the burden by elevating its elbows, clambered backward with it up the side of the nest till it reached the top, where resting for a moment, it threw off its load with a jerk, and quite disengaged it from the nest. It remained in this situation a short time, feeling about with the extremities of its wings, as if to be convinced whether the business was properly executed, and then dropped into the nest again. With these (the extremities of its wings) I have often seen it examine, as it were, an egg and nestling before it began its operations; and the nice sensibility which these parts appeared to possess seemed sufficiently to compensate the want of sight, which as yet it was destitute of. I afterwards put in an egg, and this, by a  
similar



similar process, was conveyed to the edge of the nest, and thrown out. These experiments I have since repeated several times in different nests, and have always found the young Cuckoo disposed to act in the same manner. In climbing up the nest, it sometimes drops its burden, and thus is foiled in its endeavours; but, after a little respite, the work is resumed, and goes on almost incessantly till it is effected. It is wonderful to see the extraordinary exertions of the young Cuckoo, when it is two or three days old, if a bird be put into the nest with it that is too weighty for it to lift out. In this state it seems ever restless and uneasy. But this disposition for turning out its companions begins to decline from the time it is two or three till it is about twelve days old, when, as far as I have hitherto seen, it ceases. Indeed, the disposition for throwing out the egg appears to cease a few days sooner; for I have frequently seen the young Cuckoo, after it had been hatched nine or ten days, remove a nestling that had been placed in the nest with it, when it suffered an egg, put there at the same time, to remain unmolested. The singularity of its shape is well adapted to these purposes; for, different from other newly-hatched birds, its back from the *scapulae* downwards is very broad, with a considerable depression in the middle. This depression seems formed by nature for the design of giving a more secure lodgement to the egg of the Hedge-sparrow, or its young one, when the young Cuckoo is employed in removing either of them from the nest. When it is about twelve days old, this cavity is quite filled up, and then the back assumes the shape of nestling birds in general.

Having found that the old Hedge-sparrow commonly throws out some of her own eggs after her nest has received the Cuckoo's, and not knowing how she might treat her young

ones if the young Cuckoo was deprived of the power of dispossessing them of the nest, I made the following experiment.

July 9. A young Cuckoo, that had been hatched by a Hedge-sparrow about four hours, was confined in the nest in such a manner that it could not possibly turn out the young Hedge-sparrows which were hatched at the same time, though it was almost incessantly making attempts to effect it. The consequence was, the old birds fed the whole alike, and appeared in every respect to pay the same attention to their own young as to the young Cuckoo, until the 13th, when the nest was unfortunately plundered.

The smallness of the Cuckoo's egg in proportion to the size of the bird is a circumstance that hitherto, I believe, has escaped the notice of the ornithologist. So great is the disproportion, that it is in general smaller than that of the House-sparrow; whereas the difference in the size of the birds is nearly as five to one. I have used the term *in general*, because eggs produced at different times by the same bird vary very much in size. I have found a Cuckoo's egg so light that it weighed only forty-three grains, and one so heavy that it weighed fifty-five grains. The colour of the Cuckoo's eggs is extremely variable. Some, both in ground and penciling, very much resemble the House-sparrow's; some are indistinctly covered with bran-coloured spots; and others are marked with lines of black, resembling, in some measure, the eggs of the Yellow-hammer.

The circumstance of the young Cuckoo's being destined by nature to throw out the young Hedge-sparrows, seems to account for the parent-cuckoo's dropping her egg in the nests of birds so small as those I have particularised. If she were to do this in the nest of a bird which produced a large egg, and consequently a large nestling, the young Cuckoo would pro-

bably find an insurmountable difficulty in solely possessing the nest, as its exertions would be unequal to the labour of turning out the young birds\*. Besides, though many of the larger birds might have fed the nestling Cuckoo very properly, had it been committed to their charge, yet they could not have suffered their own young to have been sacrificed, for the accommodation of the Cuckoo, in such great number as the smaller ones, which are so much more abundant; for though it would be a vain attempt to calculate the numbers of nestlings destroyed by means of the Cuckoo, yet the slightest observation would be sufficient to convince us that they must be very large.

Here it may be remarked, that though nature permits the young Cuckoo to make this great waste, yet the animals thus destroyed are not thrown away or rendered useless. At the season when this happens, great numbers of tender quadrupeds and reptiles are seeking provision; and if they find the callow nestlings which have fallen victims to the young Cuckoo, they are furnished with food well adapted to their peculiar state.

It appears a little extraordinary, that two Cuckoo's eggs should ever be deposited in the same nest, as the young one produced from one of them must inevitably perish; yet I have known two instances of this kind, one of which I shall relate.

\* I have known an instance in which a Hedge-sparrow sat upon a Cuckoo's egg and one of her own. Her own egg was hatched five days before the Cuckoo's, when the young Hedge-sparrow had gained such a superiority in size that the young Cuckoo had not powers sufficient to lift it out of the nest till it was two days old, by which time it was grown very considerably. This egg was probably laid by the Cuckoo several days after the Hedge-sparrow had begun to sit; and even in this case it appears, that its presence had created the disturbance before alluded to, as all the Hedge-sparrow's eggs were gone except one.

June 27, 1787. Two Cuckoos and a Hedge-sparrow were hatched in the same nest this morning; one Hedge-sparrow's egg remained unhatched. In a few hours after, a contest began between the Cuckoos for the possession of the nest, which continued undetermined till the next afternoon; when one of them, which was somewhat superior in size, turned out the other, together with the young Hedge-sparrow and the unhatched egg. This contest was very remarkable. The combatants alternately appeared to have the advantage, as each carried the other several times nearly to the top of the nest, and then sunk down again, oppressed by the weight of its burden; till at length, after various efforts, the strongest prevailed, and was afterwards brought up by the Hedge-sparrows.

I come now, Sir, to consider the principal matter that has agitated the mind of the naturalist respecting the Cuckoo: *why, like other birds, it should not build a nest, incubate its eggs, and rear its own young?*

There is certainly no reason to be assigned from the formation of this bird why, in common with others, it should not perform all these several offices; for it is in every respect perfectly formed for collecting materials and building a nest. Neither its external shape nor internal structure prevent it from incubation; nor is it by any means incapacitated from bringing food to its young. It would be needless to enumerate the various opinions of authors on this subject from ARISTOTLE to the present time. Those of the ancients appear to be either visionary, or erroneous; and the attempts of the moderns towards its investigation have been confined within very narrow limits; for they have gone but little farther in their researches than to examine the constitution and structure of the bird, and

having found it possessed of a capacious stomach with a thin external covering, concluded that the pressure upon this part, in a sitting posture, prevented incubation. They have not considered that many of the birds which incubate have stomachs analogous to those of Cuckoos: the stomach of the Owl, for example, is proportionably capacious, and is almost as thinly covered with external integuments. Nor have they considered, that the stomachs of nestlings are always much distended with food; and that this very part, during the whole time of their confinement to the nest, supports, in a great degree, the weight of the whole body; whereas, in a sitting bird, it is not nearly so much pressed upon; for the breast in that case fills up chiefly the cavity of the nest, for which purpose, from its natural convexity, it is admirably well fitted.

These observations, I presume, may be sufficient to shew that the Cuckoo is not rendered incapable of sitting through a peculiarity either in the situation or formation of the stomach; yet, as a proof still more decisive, I shall lay before you the following fact.

In the summer of the year 1786, I saw, in the nest of a Hedge-sparrow, a Cuckoo, which, from its size and plumage, appeared to be nearly a fortnight old. On lifting it up in the nest, I observed two Hedge-sparrow's eggs under it. At first I supposed them part of the number which had been sat upon by the Hedge-sparrow with the Cuckoo's egg, and that they had become addle, as birds frequently suffer such eggs to remain in their nests with their young; but on breaking one of them I found it contained a living foetus; so that of course these eggs must have been laid several days after the Cuckoo was hatched, as the latter now completely filled up the nest, and was by  
this

this peculiar incident performing the part of a sitting-bird\*.

Having under my inspection, in another Hedge-sparrow's nest, a young Cuckoo, about the same size as the former, I procured two Wagtail's eggs which had been sat upon a few days, and had them immediately conveyed to the spot, and placed under the Cuckoo. On the ninth day after the eggs had been in this situation, the person appointed to superintend the nest (as it was some distance from the place of my residence) came to inform me, that the Wagtails were hatched. On going to the place, and examining the nest, I found nothing in it but the Cuckoo and the shells of the Wagtail's eggs. The fact, therefore, of the birds being hatched, I do not give you as coming immediately under my own eye; but the testimony of the person appointed to watch the nest was corroborated by that of another witness.

To what cause then may we attribute the singularities of the Cuckoo? May they not be owing to the following circumstances? *The short residence this bird is allowed to make in the country where it is destined to propagate its species, and the call that nature has upon it, during that short residence, to produce a numerous progeny.* The Cuckoo's first appearance here is about the middle of April, commonly on the 17th. Its egg is not ready for incubation till some weeks after its arrival, seldom before the middle of May. A fortnight is taken up by the sitting bird in hatching the egg. The young bird generally continues three weeks in the nest before it flies, and the

\* At this time I was unacquainted with the fact, that the young Cuckoo turned out the eggs of the Hedge-sparrow; but it is reasonable to conclude, that it had lost the disposition for doing this when these eggs were deposited in the nest.

foster-parents feed it more than five weeks after this period; so that, if a Cuckoo should be ready with an egg much sooner than the time pointed out, not a single nestling, even one of the earliest, would be fit to provide for itself before its parent would be instinctively directed to seek a new residence, and be thus compelled to abandon its young one; for old Cuckoos take their final leave of this country the first week in July.

Had nature allowed the Cuckoo to have staid here as long as some other migrating birds, which produce a single set of young ones (as the Swift or Nightingale, for example), and had allowed her to have reared as large a number as any bird is capable of bringing up at one time, these might not have been sufficient to have answered her purpose; but by sending the Cuckoo from one nest to another, she is reduced to the same state as the bird whose nest we daily rob of an egg, in which case the stimulus for incubation is suspended. Of this we have a familiar example in the common domestic fowl. That the Cuckoo actually lays a great number of eggs, dissection seems to prove very decisively. Upon a comparison I had an opportunity of making between the ovarium, or *racemus vitellorum*, of a female Cuckoo, killed just as she had begun to lay, and of a pullet killed in the same state, no essential difference appeared. The uterus of each contained an egg perfectly formed, and ready for exclusion; and the ovarium exhibited a large cluster of eggs gradually advanced from a very diminutive size, to the greatest the yolk acquires before it is received into the oviduct. The appearance of one killed on the third of July was very different. In this I could distinctly trace a great number of the membranes which had discharged yolks into the oviduct; and one of them appeared as if it had parted with a yolk the preceding day. The ovarium still exhibited a cluster

cluster of enlarged eggs; but the most forward of them was scarcely larger than a mustard-feed.

I would not be understood, Sir, to advance that every egg which swells in the ovarium at the approach or commencement of the propagating season is brought to perfection; but it appears clearly, that a bird, in obedience to the dictates of her own will, or to some hidden cause in the animal œconomy, can either retard or bring forward her eggs. Besides the example of the common fowl above alluded to, many others occur. If you destroy the nest of a Blackbird, a Robin, or almost any small bird, in the spring, when she has laid her usual number of eggs, it is well known to every one, who has paid any attention to enquiries of this kind, in how short a space of time she will produce a fresh set. Now, had the bird been suffered to have proceeded without interruption in her natural course, the eggs would have been hatched, and the young ones brought to a state capable of providing for themselves, before she would have been induced to make another nest, and excited to produce another set of eggs from the ovarium. If the bird had been destroyed at the time she was sitting on her first laying of eggs, dissection would have shewn the ovarium containing a great number in an enlarged state, and advancing in the usual progressive order. Hence it plainly appears, that birds can keep back or bring forward (under certain limitations) their eggs at any time during the season appointed for them to lay; but the Cuckoo, not being subject to the common interruptions, goes on laying from the time she begins, till the eve of her departure from this country: for although old Cuckoos in general take their leave the first week in July (and I never could see one after the 5th day of that month \*),

I



month \*), yet I have known an instance of an egg's being hatched in the nest of a Hedge-sparrow so late as the 15th. And a farther proof of their continuing to lay till the time of their leaving us may, I think, be fairly deduced from the appearances on dissection of the female Cuckoo above-mentioned, killed on the 3d of July.

Among the many peculiarities of the young Cuckoo, there is one that shews itself very early. Long before it leaves the nest, it frequently, when irritated, assumes the manner of a bird of prey, looks ferocious, throws itself back, and pecks at any thing presented to it with great vehemence, often at the same time making a chuckling noise like a young hawk. Sometimes, when disturbed in a smaller degree, it makes a kind of hissing noise, accompanied with a heaving motion of the whole body †. The growth of the young Cuckoo is uncommonly rapid.

The chirp is plaintive, like that of the Hedge-sparrow; but the sound is not acquired from the foster-parent, as it is the same whether it be reared by the Hedge-sparrow, or any other bird.

It never acquires the adult note during its stay in this country.

The stomachs of young Cuckoos contain a great variety of food. On dissecting one that was brought up by Wagtails,

\* Though I am unacquainted with an instance, yet I conceive it possible, that here and there a straggling Cuckoo may be seen after this time.

† Young animals, being deprived of other modes of defence, are probably endowed with the powers of exciting fear in their common enemies. If you but slightly touch the young Hedge-hog, for instance, before it becomes fully armed with its prickly coat, the little animal jumps up with a sudden spring, and imitates very closely the sound of the word *hush!* as we pronounce it in a loud whisper. This disposition is apparent in many other animals.

and fed by them at the time it was shot (though it was nearly of the size and fulness of plumage of the parent-bird) I found in its stomach the following substances.

Flies and Beetles of various kinds.

Small Snails, with their shells unbroken.

Grafhoppers.

Caterpillars.

Part of a Horse-bean.

A vegetable substance resembling bits of tough grafs, rolled into a ball.

The feeds of a vegetable that resembled those of the goose-grafs.

In the stomach of one fed by Hedge-sparrows, the contents were almost entirely vegetable; such as wheat, small vetches, &c. But this was the only instance of the kind I had ever seen, as these birds, in general, feed the young Cuckoo with scarcely any thing but animal food. However, it served to clear up a point which before had somewhat puzzled me; for having found the Cuckoo's egg in the nest of a green linnet, which begins very early to feed its young with vegetable food, I was apprehensive, till I saw this fact, that this bird would have been an unfit foster-parent for the young Cuckoo.

The Titlark, I observe, feeds it principally with Grafhoppers.

But the most singular substance, so often met with in the stomachs of young Cuckoos, is a ball of hair curiously wound up. I have found it of various sizes, from that of a pea to that of a small nutmeg. It seems to be composed chiefly of Horse-hairs, and from the resemblance it bears to the inside covering of the nest, I conceive the bird swallows it while a nestling. In the stomachs of old Cuckoos I have often seen

masses of hair; but these had evidently once formed a part of the hairy Caterpillar, which the Cuckoo often takes for its food.

There seems to be no precise time fixed for the departure of young Cuckoos. I believe they go off in succession, probably as soon as they are capable of taking care of themselves; for although they stay here till they become nearly equal in size and growth of plumage to the old Cuckoo, yet in this very state the fostering care of the Hedge-sparrow is not withdrawn from them. I have frequently seen the young Cuckoo of such a size that the Hedge-sparrow has perched on its back, or half-expanded wing, in order to gain sufficient elevation to put the food into its mouth. At this advanced stage, I believe that young Cuckoos procure some food for themselves; like the young rook, for instance, which in part feeds itself, and is partly fed by the old ones till the approach of the pairing season. If they did not go off in succession, it is probable we should see them in large numbers by the middle of August; for as they are to be found in great plenty\*, when in a nestling state, they must now appear very numerous, since all of them must have quitted the nest before this time. But this is not the case; for they are not more numerous at any season than the parent birds are in the months of May and June.

The same instinctive impulse which directs the Cuckoo to deposit her eggs in the nests of other birds, directs her young one to throw out the eggs and young of the owner of the nest. The scheme of nature would be incomplete without it; for it would be extremely difficult, if not impossible, for the little birds, destined to find succour for the Cuckoo, to find it also

\* I have known four young Cuckoos in the nests of Hedge-sparrows in a small paddock at the same time.

for their own young ones, after a certain period; nor would there be room for the whole to inhabit the nest.

Thus, Sir, I have, with much pleasure, complied with your request; and here lay before you such observations as I have hitherto been capable of making on the natural history of the Cuckoo; and should they throw some light on a subject that has long lain hid in obscurity, I shall not think my time has been ill employed.

With a grateful sense of the many obligations I owe to the friendship with which you have so long honoured me,

I remain, &c.

EDW. JENNER.

Berkeley,  
December 27, 1787.

